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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/084,873

03/01/2002

Quinn K. Tong

1987.EEM

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7590

06/09/2004

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EXAMINER

ZARNEKE, DAVID A

ART UNIT

PAPER NUMBER

2827

DATE MAILED: 06/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n N .

10/084,873

Applicant(s)

TONG ET AL.

Examin r

David A. Zarneke

Art Unit

2827

-- The MAILING DATE of this c mmunication appears on the cover sheet with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

- 4) ☒ Claim(s) 1,3-22 and 24-39 is/are pending in the application.
- 4a) Of the above claim(s) 33-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-22 and 24-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/22/04 has been entered.

Response to Arguments

Applicant's arguments filed 3/1/04 have been fully considered but they are not persuasive.

Applicant argues that one skilled in the art one skilled in the art would not combine Gilleo and Kunitomo because such a skilled artisan would not be led to combine a 2-methylimidazole/pyromellitic anhydride complex, let alone an adduct, with a composition containing a fluxing agent because the addition of the fluxing agent would drastically alter the curing rate of the composition. Thus, it is surprising that the present invention provides an encapsulant that is B-stageable having the combination of the adduct and a fluxing agent.

The examiner asserts that Kunitomo teaches a similar composition and more importantly teaches that the epoxy resin composition is useable in injection molding

(page 9 of the translation, lines 3+), which deposits a liquid composition and then cures to a solid state. This meets the definition of a B-stageable composition as defined by applicant's specification, page 3, line 25 to page 4, line 2, which states that B-stageable "means that the underfill must be solidified after its placement on a wafer".

Applicant further argues that one skilled in the art would not be led to the use of an imidazole-anhydride adduct via the combination of Gilleo, Kunitomo and Kobayashi. The use of an anhydride as a curing agent is not conventionally known in the art of B-stageable underfill encapsulants. While Kunitomo discloses the use of a potential anhydride complex, one skilled in the art would not have expected that complex to work in conjunction with a fluxing agent, as set forth above.

The examiner asserts that Kobayashi teaches a similar composition that is useable in transfer molding, which means depositing a liquid and then curing to a solid state. This meets the definition of a B-stageable composition as defined by applicant's specification, page 3, line 25 to page 4, line 2, which states that B-stageable "means that the underfill must be solidified after its placement on a wafer".

Applicant has amended the claims to include the limitation of at least one fluxing agent.

This limitation is taught in Gilleo (4, 18+). The full rejection of the claims is detailed below.

Claims 1, 3-22, 24-39 are pending in this application. Claims 33-39 have been withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525.

Gilleo teaches a B-stage-able underfill encapsulant (7, 54+) comprising:

- a) thermal curable resin system comprising an admixture of at least one epoxy, one preferably being biphenyl A (4, 7+);
- b) a hardener such as acid anhydrides (4, 12+);
- c) at least one solvent (4, 40+);
- d) at least one inorganic filler (4, 23+); and
- e) at least one fluxing agent (4, 18+),

wherein the encapsulant solidifies during the B-stage process to produce a smooth, non-tacky surface on a semiconductor wafer (4, 3+) or silicon chip.

The B-stage encapsulant of Gilleo inherently produces a smooth, non-tacky surface because Applicant's own specification states that B-stage means that the underfill must be solidified after its placement on a wafer to provide a smooth, non-tacky coating (page 3, last line and page 4, top).

Gilleo fails to teach the use of an imidazole-anhydride adduct as the hardener.

Kunitomo teaches an epoxy resin composition (abstract) comprising an epoxy resin; a phenol containing compound, namely a phenol novolak resin; a 2-methylimidazole/pyromellitic anhydride complex curing agent; and an inorganic filler (page 233, 2nd column, 4th to last line).

It would have been obvious to one of ordinary skill in the art to use the curing promoting agent of Kunitomo in the invention of Gilleo because Kunitomo teaches that the anhydride-imidazole complex provides long-term storage stability.

Claims 3-22 and 24-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525 as applied to claim 1 above, and further in view of Kobayashi et al., JP 62-081416A.

Kobayashi teaches an epoxy composition for sealing a semiconductor comprising an epoxy resin, a phenol type curing agent and a curing promoting agent.

It would have been obvious to one of ordinary skill in the art to use the composition of Kobayashi in the invention of Gilleo and Kunitomo because Kobayashi is relied upon to teach the conventionality of the components.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Regarding claim 3, Kobayashi teaches an epoxy and a phenol, wherein the epoxy can comprise an aliphatic epoxy (3, 4th to last paragraph).

With respect to claim 4, Kobayashi teaches an epoxy novolak resin (3, 4th to last paragraph).

As to claims 5 and 6, Gilleo teaches the use of bisphenol A (4, 7+).

Regarding claims 7-11, it would have been obvious to one of ordinary skill in the art to optimize the percentage of epoxy and phenol in the epoxy/phenol admixture, and the percentage of the admixture in the whole encapsulant (MPEP 2144.05(b)).

With respect to claim 12, Kobayashi teaches the use of a triphenylphosphine and it would have been obvious to one of ordinary skill in the art to optimize the anhydride used (MPEP 2144.05(b)).

As to claim 13, it would have been obvious to one of ordinary skill in the art to optimize the imidazole-anhydride adduct used (MPEP 2144.05(b)).

Regarding claims 14 and 15, it would have been obvious to one of ordinary skill in the art to optimize the percentage of the imidazole-anhydride adduct in the encapsulant (MPEP 2144.05(b)).

With respect to claims 16-18, considering Gilleo teaches the use solvents or solvent blends that are comparable to the components selected (4, 40+), it would have been obvious to one of ordinary skill in the art to optimize the solvent selected (MPEP 2144.05(b)).

As to claim 19, it would have been obvious to one of ordinary skill in the art to optimize the percentage of solvent in the encapsulant (MPEP 2144.05(b)).

Regarding claims 20 and 21, Gilleo teaches the use of silica filler (8, 12).

With respect to claim 22, it would have been obvious to one of ordinary skill in the art to optimize the percentage of filler in the encapsulant (MPEP 2144.05(b)).

Regarding claims 24 and 25, it would have been obvious to one of ordinary skill in the art to optimize the flux used (MPEP 2144.05(b)).

With respect to claims 26 and 27, it would have been obvious to one of ordinary skill in the art to optimize the percentage of flux in the encapsulant (MPEP 2144.05(b)).

As to claim 28, Gilleo teaches the use of wetting agents, cross-linking agents and polymerization catalysts (4, 18+).

Regarding claims 29 and 30, it would have been obvious to one of ordinary skill in the art to optimize the surfactant and diluent used (MPEP 2144.05(b)).

With respect to claim 31, the B-stage processing of the encapsulant before dicing the wafer into chips is conventionally known in the art.

The use of conventional materials to perform there known functions in a conventional process is obvious. In re Raner 134 USPQ 343 (CCPA 1962).

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gilleo et al., US Patent 6,194,788, in view of Kunitomo, JP 58103525.

Gilleo teaches a wafer having B-stageable underfill composition deposited on one face of the wafer, the B-stageable composition comprising:

- a) thermal curable resin system comprising an admixture of at least one epoxy, one preferably being biphenyl A (4, 7+);
- b) a hardener such as acid anhydrides (4, 12+);
- c) at least one solvent (4, 40+);
- d) at least one inorganic filler (4, 23+); and
- e) at least one fluxing agent (4, 18+).

Gilleo fails to teach the use of an imidazole-anhydride adduct.

Kunitomo teaches an epoxy resin composition (abstract) comprising an epoxy resin; a phenol containing compound, namely a phenol novolak resin; a 2-methylimidazole/pyromellitic anhydride complex curing agent; and an inorganic filler (page 233, 2nd column, 4th to last line).

It would have been obvious to one of ordinary skill in the art to use the curing promoting agent of Kunitomo in the invention of Gilleo because Kunitomo teaches that the anhydride-imidazole complex provides long-term storage stability.

Conclusion

Any inquiry concerning this communication from the examiner should be directed to David A. Zarneke at (571)-272-1937. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on (571)-272-1957. The fax phone number is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

David A. Zarneke
Primary Examiner
June 2, 2004

